BIRKENHEAD
7.

HOW TO PREVENT
SMALL-POX:

BEING PLAIN FACTS ON VACCINATION, AND HINTS ON SANITARY PRECAUTIONS.

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SALUS POPULI SUPREMA LEX ESTO.

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PREFACE TO FIRST EDITION.

THE ignorance and neglect of vaccination and sanitary matters and the consequent presence of 600 cases of smallpox in the town, have induced me to lay before the public a part of the evidence upon which the beneficial effects of vaccination are founded, to which are added a few simple sanitary precautions. Brevity has been constantly courted, and the facts and reasons adduced have, for the most part, been stated without comment, and left to speak for themselves. The evidence in favour of vaccination is so great as to gain the assent (with a few unimportant exceptions) of the whole medical profession, so great that a high authority, Professor Alison, has declared " That he who disputes it is equally unreasonable as he who opposes any proposition in Euclid."

The following pages have been hurriedly written during the last few days in moments snatched now and then from a laborious general practice. It is, therefore, hoped that any incompleteness will be excused.

I have to acknowledge my obligations to my illustrious and revered teacher, Sir William Jenner, Bart., Physician to Her Majesty the Queen; Mr Marson, Surgeon to the London Small pox Hospital; and Dr. Seaton, Medical Inspector to the Privy Council, for several communications; for valuable original information kindly and courteously tendered to me more than once without solicitation.

Sunderland, June 15, 1871.

MORDEY DOUGLAS.

PREFACE TO THIRD EDITION.

In placing before the public a third issue of this little pamphlet, I have only to remark that there have been a few alterations made in the text, with a small addition of information, amongst which will be most conspicuous a refutation of Professor F. W. Newman's reply to the Bishop of Manchester.

En passant, I may mention that 188 cases of smallpox have been under my care during this epidemic. Of 164 vaccinated only 4 died (all badly vaccinated), that is 1 in 41, or 2·43 per cent.; whilst of 24 unvaccinated 14 died, that is 1 in less than 2, or 58·33 per cent. All the unvaccinated who recovered had a very narrow escape, whilst quite half of the vaccinated required scarcely any treatment. Not a single person who has been under my care had been re-vaccinated. Against such ample proof as these cases afford of the modifying influence of vaccination it is folly for anti-vaccinators to utter their unreasoning twaddle. The cases have been carefully recorded, and are available for investigation by any respectable enquirer.

The epidemic has raged more furiously in Sunderland than in any other town in the kingdom. The at first slow, but subsequent rapid march of the epidemic in Sunderland is seen by the weekly death-rate from smallpox as follows, commencing with the week ending February 4th :—1, 1, 0, 0, 1, 2, 0, 0, 1, 1, 2, 2, 2, 4, 9, 9, 13, 22, 23, 46, 43, 55, 45, 53, 50, 32, 31, 52, 37, 33, 28, 20, 17, 21, 32, 12, 26, 10, 12, 12, 11, 12, and 13, making a total of 796 deaths from smallpox up to the week ending November 25.

M. D.

November 27, 1871.

ON VACCINATION, OR THE INOCULATION OF THE COW-POX.

History of Vaccination.—Vaccination appears to have been practised in India and China from very remote times, but in Europe its discovery was due to the genius of Edward Jenner, of Berkeley, in Gloucestershire, who was first led to the discovery by the popular belief in the dairy farms that those who had suffered from cowpox (vaccinia) could not afterwards take smallpox. In 1768 Edward Jenner, then a pupil with a surgeon at Sodbury, heard a young countrywoman say that she could not take smallpox "for she had had cowpox." This deeply impressed his mind, and was the original cause of his enquiry into the

Nature of the Cowpox.—Cowpox, or vaccinia, is a natural disease of the cow, and was named by Jenner *variolæ vaccinæ*, as in fact it is, the smallpox of the cow. It runs a definite course, mainly consists of a vesicular eruption on the udder and teats, and it may be transmitted to man by *direct* contact, accidentally as to the milkers in milking, or purposely by the surgeon. Ceely, of Aylesbury, proved by experiment the correctness of Jenner's opinion that the cowpox of the cow was the smallpox modified by the constitution of the cow. Ceely inoculated some cows with smallpox matter, thereby inducing not smallpox but cowpox, and children inoculated (vaccinated) with lymph from the cows presented the usual symptoms caused by ordinary vaccination.

Discovery of Vaccination.—On enquiry Jenner found that the popular notion was probably well founded, and having instituted experiments, he proved it to be true. He met with many difficulties and apparent contradictions to discourage him in his researches. Whilst many persons who had had the cowpox could not be infected with the virus of smallpox, others, who seemed to have undergone the cowpox, took smallpox when inoculated, and the medical men in the neighbourhood told him "that what was commonly *called* cowpox was not a certain preventive of smallpox." Most men would have given up the investigation at this point, and, as he states, "this for a while damped, but did not extinguish, my ardour," yet he persevered and availed himself of every opportunity to observe the cow when undergoing the cowpox. He soon discovered the cow was subject to a variety of eruptions on the teats, all capable of inducing sores on the hands of the milkers, and that they were all called cowpox by the farmers. After much research, he detected that only one of the eruptions possessed the power to protect from smallpox infection; this he called "True cowpox," the others spurious, because they were not cowpox at all.

Not having seen cowpox, except in dairies, where the cows were milked by men, who also attended the horses, Jenner, for some time, thought the cows always derived the disease from the horses, that the ostlers were the medium of infection, and that the disease of the horse, called the "grease," was the source of the cowpox.

Many of Jenner's attempts to inoculate direct from the horse failed, and when he succeeded he found that it was not the "grease," but another disease, which had been confounded with it. He discovered the horse was subject to a specific eruptive fever—*variolæ equinæ* This, the horsepox, and the "grease," both manifest themselves on the heels of the horse, yet they are two distinct diseases. The matter from the "grease" has no prophylactic virtues, but the lymph from the vesicle of the horsepox, when inoculated into the human system, protects from smallpox in the same way as cowpox.

It is now well known that the horse and the cow are both affected with the smallpox naturally, that is just as man is. Jenner had no sooner removed these obstacles than a more formidable obstruction presented itself. He learned that milkers who had had the true cowpox had subsequently taken the smallpox. Not even at this apparently hopeless stage of the enquiry did Jenner lose heart. All these difficulties only served to stimulate him to further questioning of nature and show the greatness of his mind, the brilliancy of his genius.

"It occurred to him that the virus of the cowpox itself might have undergone some change whereby its specific virtues were lost; that, in its deteriorated state, it may have been capable of producing a local disease upon the hand of the milker, but no such influence upon the constitution as is requisite to render the individual unsusceptible of variolous contagion, so that the same cow might one day communicate a genuine and efficacious preventive, and the next no beneficial influence whatever on the constitution." Continuing to carefully watch the disease in the cow he triumphed, for he found his ingenious reasoning was fully supported by facts.

"*Arm to arm Vaccination.*"—Whilst pursuing his investigations the idea occurred to Jenner that the cowpox might be communicated by the surgeon first from the cow to man and then from individual to individual. He soon showed that it was quite possible, and that all, in a series of transmissions, were equally protected as was the first infected direct from the cow. In this consists the great utility of the discovery.

Birthday of Vaccination.—Sarah Nelmes, dairymaid, was infected with the cowpox from her master's cows through a scratch on her hand, and from one of the vesicles resulting Jenner took the fluid lymph and inserted it into the arm of a boy, named Phipps, on the 14th of May, 1796. Phipps passed through the cowpox in the usual mild way. On the 1st of July following, and again after a lapse of five years, he was inoculated with smallpox matter, and the indomitable discoverer had the satisfaction of seeing that the boy had been rendered secure from the contagion of the smallpox.

Continuing his researches, he announced to the world in 1798 the discovery of vaccination: a discovery of matchless splendour, of a brilliancy as unrivalled as that of the diamond, a gem of such priceless value as to invest Jenner with greater influence with emperors and kings than the British Government; and to surround his name with a world-wide fame.

Two years after vaccinating Phipps, Jenner was able to report

"Upwards of 6,000 persons have now been inoculated with the virus of cowpox, and the greater part of them have since been inoculated with that of smallpox, and exposed to its infection in every rational way that could be devised, without effect."

Thus Jenner proved by demonstration every step of his masterly enquiry that cowpox (vaccination) is really a protection against smallpox. He found it a popular idea; he left it a scientific fact.

How Vaccination Protects.—It is a matter of common observation that persons who have had scarlet fever, typhus, measles, smallpox, &c., very rarely suffer from a second attack of any of these diseases, and, as cowpox (vaccinia) is smallpox rendered harmless by passing through the system of the cow, but preserving its power to prevent smallpox, vaccination is the inoculation of a mild form of smallpox, by which the surgeon forestalls by prepossession, and literal substitution, an attack of the natural disease—smallpox.

When a person has the smallpox there is a large reproduction of the virus, or poison of the disease. The virus therefore finds in the body appropriate nutriment, a pabulum in which to grow and multiply itself, otherwise it would die like a plant which is placed in unsuitable ground. The growth and multiplication of the smallpox virus does away with the pabulum, just as the growth of the yeast plant does away with the sugar in an infusion of malt. The sugar in an infusion of malt having all been transformed it matters not how much yeast is added, no further fermentation will take place; so likewise the pabulum of susceptibility to smallpox having been done away with by an attack of the disease, or of vaccination, the patient may *subsequently* be exposed to the infection of, or be inoculated with, smallpox without effect. The susceptibility of the system is gone—he is protected!

How soon Protective.—Perfect vaccination is surrounded after the ninth or tenth day by a red areola, and, to be protective, it should have arrived at this stage before there is any *illness* from smallpox. Fourteen days after the infection of smallpox has been received into the system the eruption of the disease appears. During twelve out of the fourteen days there is usually freedom from illness, then, after forty-eight hours' severe indisposition, the eruption is visible. Mr Marson illustrates tho point by the following example :—" Suppose an unvaccinated person to inhale the germ of variola on a Monday, if he be vaccinated as late as on the following Wednesday, the vaccination will be in time to prevent the smallpox being developed ; if it be put off until Thursday the smallpox will appear, but will be modified. If the vaccination be delayed until Friday it will be of no use, it will not have had time to reach the stage of areola, the index of safety, before the illness of smallpox begins."

It now remains to establish by the experience of the last seventy years the proposition

VACCINATION PROTECTS FROM SMALL-POX.

1. Dr. Woodville within two years (1799-1801) vaccinated 7,500 persons, and subsequently inoculated half of them with the virus of smallpox without producing in *any* of them this disease. Had they been unvaccinated only one in sixty would have resisted the inoculation of the smallpox virus.

2. During an epidemic in Chelsea Mr Marshall found that out of 757 persons in infected families 231 had been vaccinated, whilst 526 were unvaccinated. Of the vaccinated twenty-seven, or about 13 per cent., contracted smallpox, whilst of the unvaccinated 519, or all but *seven* (about 98 per cent!) were attacked.

3 Drs. Seaton and Buchanan examined 52,407 children in the public schools of London, and found that 2,837 had no marks of vaccination ; of these 1,010 (360 per 1,000) were marked by smallpox, whilst out of 49,570 vaccinated only eighty-eight, less than 2 per 1,000, were marked. It may be inferred from these figures that the 1,010 unvaccinated scarred by smallpox represented 619 fatal cases, more than a sixth of the original number of the unvaccinated. The 49,570 vaccinated represented 10,796 lives saved from death by smallpox, and 28,365 attacks of the disease prevented.

4. From 1836 to 1851, inclusive, 363 children under five years

of age were received into the London Smallpox Hospital; of these 356 were unvaccinated and only seven vaccinated. Seeing that the 356 must have come out of not more than 6 per cent. of the London population under five years of age, the unvaccinated were 79,671 per cent. more liable to smallpox than the vaccinated.

5. The Bishop of Manchester spoke lately in favour of the protective value of vaccination, but Professor F. W. Newman, in reply to him, has asserted that the vaccinated are "*twice as liable to smallpox as the unvaccinated.*" He says "it is admitted that on the average of recent years, in the experience of the London Smallpox Hospital, full *four-fifths* of the patients have been vaccinated. The Registrar-General tells us that, on an average of four years, only 65·5 per cent. of the English people were vaccinated; that is, less than *two-thirs.* Thus the vaccinated *two-thirds* furnish *four-fifths* of the smallpox cases, while the unvaccinated *one-third* furnish only *one-fifth*: that is, the vaccinated are *twice* as liable to smallpox as the unvaccinated." Unfortunately for Professor Newman's logic the so-called facts on which he rests his argument have no existence. The Registrar-General did *not* refer to the *whole* of the English people, but *only* to the children born in the years quoted. A moment's thought might have prevented Professor Newman falling into the blunder. The patients in the London Smallpox Hospital being supplied by the London population, Professor Newman should have based his statements on the people of London exclusively. Had he done so he would have found that 94 per cent. of the children attending the public schools have been vaccinated. Take the London recruits (by no means the most respectable or most cared-for class of the community); above 90 per cent. of them have marks of vaccination. To judge of vaccination as an *absolute* protection against *taking* smallpox we must know the exact numbers of vaccinated and unvaccinated exposed to infection. Mr Marshall's observations, previously referred to, on this point prove the great protective value of vaccination. Let us test vaccination by the number of deaths at the London Smallpox Hospital. From 1836 to 1851, of 2,654 unvaccinated patients 996 died, but of 3,094 vaccinated only 268 died, showing that vaccination pre-

vented 893 deaths from smallpox. Let Professor Newman ponder over the paragraphs in this and the next section, and I think he will find it impossible to arrive at any other conclusion but that vaccination is a great protection against *taking* smallpox, and when done *efficiently* is an *almost certain preventive* of death by that disease.

6. During the twenty years from 1816 to 1836, inclusive, several epidemics of smallpox raged in the West Indies, but among the vaccinated white troops (86,661) there were *no deaths*, nor among the vaccinated black troops (40,934) was there *one* case of smallpox.

7. In Malta, from 1818 to 1838, inclusive, in the troops (40,826) there were only *two deaths* from smallpox, while among the civil population there died in one year (1830) 1,048.

8. The vaccinated white troops of Western Africa escaped smallpox entirely, while the unvaccinated black population died by hundreds.

9. I may mention as instances of the facility and rapidity with which this most infectious and fatal disease ravages a wholly unprotected population—introduced into Mexico in 1518, smallpox suddenly destroyed three and a-half millions of the population, leaving none to bury them. In 1734 two-thirds of the inhabitants of Greenland were swept away by smallpox. In 1707 it destroyed 18,000 out of 50,000 of the population of Iceland.

SMALL-POX IN THE VACCINATED.

Vaccination Lessens very much the Severity and the Fatality of Smallpox.—Jenner expressed his opinion as to the protective value of vaccination in the following words :—" Duly and *efficiently* performed it will protect the constitution from subsequent attacks of smallpox as much as that disease itself will. I never expected it would do more ; and it will not, I believe, do less." Smallpox itself not being an absolute protection against a second attack of the disease, it is unreasonable to blame vaccination for not doing more than its discoverer and the medical profession claim for it, and to expect that its protective power shall be infallible.

1. *Protection of Previous Smallpox and Vaccination Compared.*— Of 5,774 boys admitted into the Royal Military Asylum at Chel-

sea from 1803 to 1851, 1,950 were marked by smallpox on admission, 3,824 either had marks of vaccination or were on admission vaccinated; of the former 6·15 per thousand, and of the latter class 7·06 contracted smallpox subsequently during their residence in the asylum.

The ratio of attacks and deaths in each class is seen at a glance in the table following:—

Persons Marked.	Number of Boys.	Of whom subsequently		Ratio per 1,000.	
		Had small-pox.	Died of small-pox.	Cases.	Deaths.
Boys with marks of smallpox	1950	12	4	6·15	2·05
Boys with marks of vaccination	3824	27	0	7·06	0·00

It would appear from this table that the protection afforded by vaccination against being attacked is a little less complete than that given by an attack of natural smallpox, but much greater against death. The difference may be accounted for by the following reasons:—Vaccination is often performed inefficiently and without due care, and although it is true vaccination is an attack of smallpox, it is a very mild one, and consequently it does not so thoroughly transform and destroy the smallpox pabulum in the blood as the natural disease, as to prevent the individual in every case becoming, after a lapse of years, susceptible to the infection of smallpox. The chance of the vaccinated recovering is, according to the observations of Mr Marson, the able surgeon of the Smallpox Hospital, London, nearly four times greater than that of those who have previously had smallpox, and for this reason—that the constitution of those unvaccinated who recover from natural smallpox is frequently so shattered and undermined that they fall an easy prey to a second attack.

2. *Modified Nature of the Attack.*—When vaccination fails to protect completely against smallpox, it renders the disease in

almost every case much less severe, so mild that there is very little pitting of skin, whilst the unvaccinated who recover are, as a rule, frightfully disfigured for life, many of them being rendered blind or deaf.

3. *The Fatality.*—During the thirty-five years Mr Marson has been surgeon to the London Smallpox Hospital he has had upwards of 15,000 cases of smallpox under his personal care, and the admirable manner in which he has recorded every particular about this vast number is beyond all praise He has shown, with a precision it is impossible to gainsay, that the modifying power is in the exact ratio of the excellence of the vaccination, as evidenced by the number and character of the vaccine marks.

The following table (Marson) shows the influence of vaccination in reducing the fatality of smallpox :—

Classification of patients affected with smallpox.	Number of deaths per cent. in each class.
1. Unvaccinated	35
2. Stated to have been vaccinated, but having no marks	23·57
3. Vaccinated having 1 mark	7·73
" 2 "	4·70
" 3 "	1·95
" 4 "	0·55
4. Having previously had smallpox	19

So that the thoroughly well vaccinated run about one-seventieth part of the risk of dying incurred by the unvaccinated.

The following table shows the percentage of deaths in the two classes—vaccinated and unvaccinated—at the Smallpox Hospital each year from 1863 to 1870, inclusive :—

	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
Unvaccinated	48·0	36·0	38·0	35·7	36·8	34·0	27·7	38·5
Vaccinated	12·0	8·7	7·4	7·3	8·29	6·2	7·0	7·9

THE DECLINE OF SMALL-POX IS PRINCIPALLY DUE TO VACCINATION.

The opponents of vaccination ascribe the decline of smallpox to :—

1. Improved sanitary arrangements.
2. The tendency of epidemics to become milder and die out.

This opinion is disproved by the following facts:—

1. The present epidemic is the most fatal within the memory of man; the average fatality of the unvaccinated patients at the London Smallpox Hospital has been for fifty years 35 per cent.; at present it is 49 per cent.

2. Smallpox, the most infectious disease known, has declined more than other less infectious diseases.

3. Smallpox is now as fatal and prevalent in unvaccinated countries as it was in England before the days of Jenner. Dr. Pringle says of smallpox in India:—" I would beg to add that, after a continuous residence of nearly thirteen years in India, and having seen cholera in its most fatal haunts during three years at Juggernaut, and witnessed the effects of famine, I have arrived at the conclusion that, though the former may count its victims by hundreds, and the latter by larger numbers, though at longer periods, yet both pale before the spectre of smallpox, stalking yearly through densely-crowded villages, and seizing its victims from the children born since its last visit with a mortality which it is appalling to contemplate; and knowing this as I do, I confess to feeling an earnest desire to do all that in me lies to check a scourge allowed to be preventible. If during my short stay in this country I have succeeded in enlisting on the side of vaccination one tithe of the sympathy and help which the subject demands, I feel I shall not have pleaded in vain for the infant population of Hindostan." Again he says, " to those living in a country enjoying the benefits and blessings of vaccination, it is very difficult to convey any accurate idea of the univeral prevalence of smallpox in India in districts where vaccination is not practised; the following, however, may be of assistance to those unacquainted with the country in aiding them to form some estimate of what a fatal scourge smallpox must be in the locality alluded to. In the Doab, in the district lying between the Ganges and the Jumna, and south of the Sewalick range, with a population of upwards of 9,000,000, I can state, from the experience of the past four years, that 95 per cent. of the population have been attacked with smallpox at some period of their lives, and that in 60 per cent. the traces of the disease

are seen on the face, while in the remaining 35 per cent. the marks will be found if the search is sufficiently careful."

The late Sir James Y. Simpson, Bart., M.D., in a pamphlet entitled "Proposal to Stamp out Smallpox," and published in 1868, relates that from a single case of smallpox, left on the island of Puynipet, the infection spread until 3,000 out of a population of 5,000 fell victims to the disease.

The reader having become familiar with the protective and modifying power of vaccination, will readily give his assent to the assertion that, the progressive decline of smallpox mortality in this country, since the discovery of vaccination, and whilst unprotected communities have been frightfully scourged, is mainly due to vaccination.

Before the introduction of vaccination, the annual death-rate from smallpox per million of the population was 3,000, now it is only 202.

In other countries the same blessings have followed the practise of vaccination. According to Mr Simon, the eminent chief of the medical department of the Privy Council, since the introduction of vaccination, "The fatality of smallpox in Copenhagen is but an eleventh of what it was; in Sweden a little over a thirteenth; in Berlin and in large parts of Austria but a twentieth; in Westphalia but a twenty-fifth."

RE-VACCINATION.

Three-fourths of the vaccinated patients at the London Smallpox Hospital have been very imperfectly vaccinated, presenting, in many cases, no vaccine mark, or only one or two; and four-fifths of them are between fifteen and thirty years of age, rather more than a twelfth under fifteen, and only one forty-ninth under ten.

From these facts we may infer the importance of re-vaccination, and the time at which it should be done. By re-vaccination all the badly vaccinated in infancy would be picked up and protected, and the well vaccinated would receive additional protection.

The approach of puberty (12th to 14th year) is clearly indicated as the time beyond which it is unsafe to delay re-vaccination.

There can be little doubt that if, at the outbreak of the present epidemic every person had been vaccinated, or re-vaccinated, as the case might be, there would now have been no cases of smallpox in Sunderland. It is unnecessary to have the operation repeated every time there is an epidemic. Vaccination thoroughly performed in infancy, and repeated with care at puberty, is amply sufficient to protect the people from smallpox. Dr. Seaton well expresses the opinion of the profession as to the value of re-vaccination in the following passage. He says:—"After effectual *re-vaccination*, smallpox, even in its most modified form, is found very rarely, or scarcely ever, to occur. Thus, Heim found that in five years there occurred amongst 14,384 re-vaccinated soldiers in Würtemberg only one instance of varioloid; among 30,000 re-vaccinated persons in civil practice only two cases of varioloid, though during these years smallpox had prevailed in 344 localities, producing 1,674 cases of modified or unmodified smallpox among the not re-vaccinated, and in part not vaccinated, population of 363,298 persons, in those places in which it had prevailed. In the Prussian army, since the introduction of systematic re-vaccination of all, the annual deaths from smallpox (which at one time were 104) have not averaged more than 2; and, on analysis of 40 fatal cases that occurred in 20 years, it appeared that only 4 were in persons who were said to have been successfully re-vaccinated"

Mr Marson tells me that during the thirty-five years he has been connected with the Smallpox Hospital he has re-vaccinated all the nurses and servants who have not previously had the smallpox before allowing them to enter on their duties, and not one of them has taken the smallpox. Enquiring of Mr Marson what proportion of the nurses and servants owed their protection to re-vaccination, he replied from two-thirds to three-fourths. When the hospital was being enlarged a great many work-people were engaged about the institution for several months; most of them were re-vaccinated; these all escaped, but amongst the few who were not re-vaccinated two were attacked by smallpox.

ALLEGED DANGERS OF VACCINATION.

It has now to be considered whether vaccination is attended by injurious effects sufficient to detract from or outweigh the protection it has been shown to confer.

Erysipelas, it is alleged, is often excited by vaccination, and extracts are given to show that Jenner held erysipelas—the specific disease erysipelas—to be a concomitant of vaccination. Now this was not Jenner's view, and if the passages cited be read in their context it will be quite manifest that he never meant anything of the kind. Jenner was describing a new disease, or rather a disease which had not before been noted, or described; and in so doing he very naturally likened the areola or inflammatory blush, which always accompanies true vaccine, to the appearance of erysipelas, though he doubted he was not "critically exact."

He never meant to assume any connection between cow-pox and the *general* disease known as erysipelas. His language might have been more precise, but his meaning was quite obvious. Now as to the actual connection between vaccination and erysipelas. Because in 1862-7 three-tenths of the deaths from erysipelas in England were under the age of one year, and because vaccination is now generally done under that age, these two things are put together as cause and effect. But if there were the relation supposed, there ought to be many more deaths from erysipelas under the age of one year, now that infantile vaccination is so much more practised than, say a quarter of a century ago, when it was so very usual to defer it beyond the first year of life. Is that the case? For England, generally, there is no means of making the comparison, because it has been only of late years that the Registrar-General has analysed the causes of death at different ages for the kingdom at large; but for one part of the kingdom—London—this analysis has been made long enough to admit the comparison, and what do we find? Why take the six years 1847-52 before the compulsory Act, and the erysipelas deaths in London under one year of age were in the aggregate 652, while for the six years 1862-7 they were 704, the London population having increased in the time in very much larger proportion. In 1851 the population of London was 2,362,236, and in 1861, 2,803,989. From 1862-7 the mean population was nearly, or quite three millions. Proportionately, then, the erysipelas mortality under one year of age had diminished, though there had been a large increase in the amount of infantile vaccination. In fact, though, as is well known, erysipelas *may* follow vaccination in weakly or unsound constitutions, as it may any slight wound, such sequence is a very rare event, and no appreciable proportion of the erysipelas deaths under one year of age is in any way connected with vaccination.

Skin Diseases are common *after* vaccination, but not, therefore, caused *by* vaccination. Affections of the skin, such as eczema, are very liable to break out about the age at which vaccination is performed, and are as common amongst the unvaccinated. The most that can be asserted is, that vaccination may occasionally act as an *exciting* cause, just as teething, or a common cold would do, and thus cause a latent disease to appear sooner than it otherwise would have done.

Measles and Scarlatina.—It is alleged that vaccination has caused an increased mortality from these diseases. Since the introduction of vaccination, there have been more deaths from measles and scarlatina, and this very fact is really an argument in favour of, not against vaccination; it refutes the anti-vaccinators' idea that the decline of smallpox is due to sanitary improvements. How is it that if sanitary precautions have so reduced the most infectious smallpox, they have not caused a corresponding decline in the mortality of the less infectious measles and scarlatina? Let the objectors explain. Vaccination has not produced a greater liability to measles and scarlatina, but has saved a great many from death by smallpox, who, of course, have increased the number amongst whom these diseases might spread; but surely this is not an argument against vaccination, except on the principle that it is useless to save a man from drowning because he might be burned to death at a future time.

Scrofulous Diseases, including Consumption.—The anti-vaccinators also charge vaccination with having increased the death-rate from consumption. Vaccination does not render mankind immortal, it protects from smallpox alone, and the thousands it saves every year from death by smallpox die afterwards, of course, of some other diseases. It is really a question of comparative liability, and Dr. Quain, Physician to the Consumption Hospital, found, on special enquiry, there was no reason to believe that vaccination caused increased liability to consumption. Many of those saved by vaccination from smallpox are consumptives, and sooner or later die of consumption; thus vaccination is indirectly the *innocent* cause of some persons dying of consumption. Vaccination, in preventing smallpox, does not render people more prone to consumption, it simply does not prevent those who are *already consumptive* continuing so. Smallpox, by weakening the system, is a powerful exciting cause of scrofulous diseases, including consumption, and vaccination, by preventing smallpox, is a great *preventive of consumption.* We find from Dr. Greenhow's exhaustive research that in 1746-55, the golden age of the anti-vaccinators, the scrofulous death-rate was more than five times as great as our present one. Although in estimating the former fatality of consumption Dr. Greenhow included "pneumonia, which formerly may have been counted to fever;" the "respiratory diseases of children, which would formerly have been counted to 'chrisomes,'" and "similar affections of advanced age, which would formerly have been counted to 'old age,'" still the *pulmonary death-rate of the present time is seven per cent. lower than the pulmonary death-rate of* 1746-55.

How about the general death-rate? Has it increased since the introduction of vaccination? Certainly not! In London, in the middle of last century, it was 1 in 28 of the population, in the middle of this it was 1 in 40. The average duration of life in this country is steadily on the increase, and a greater number of persons attain a good old age now than at any previous time.

Syphilis.—It is often supposed that this loathsome disease is transmitted by vaccination, but it is almost certain that if properly performed it could not be. When it is considered that the many experiments with the blood of syphilitic children has never once resulted in the transmission of syphilis, we may well doubt whether the minute portion which might accidentally (but should not) get mixed with vaccine lymph, could convey the disease. In the experiments in France by Cullerier and Taupin, and in Germany by Heim, vaccine lymph was purposely taken from known syphilitic children, but in the healthy children inoculated with it, it produced nothing except vaccinia; in no case was syphilis engendered.

It may be inferred from these experiments that the danger of transmitting syphilis by vaccination must be very minute, and we may safely believe with Mr Simon that "if syphilis could be diffused by the vaccine lymph of children with an hereditary taint of that disease, this possibility must long ago have been made evident on a scale far too considerable for question." The experience of the profession proves how extremely rare such an event must be. Acton and Langston Parker, with whom syphilis has been a life study, have never seen a case; Marson, Leese, and Tomkins, in London, and Bousquet and Steinbrenner, in Paris, whose experience of vaccination has been enormous, bear the same testimony. Dr. West, the eminent writer on the diseases of children, in 26,000 children under his care has never seen "the slightest pretext for supposing that syphilis had been communicated to infants through the medium of the vaccine lymph." Sir W. Jenner, Physician in ordinary to Her Majesty, and for many years Physician to the Hospital for Sick Children, and to University College Hospital, is of opinion that in no case has he reason to believe, or even suspect, that any constitutional taint has been conveyed from one person to another by vaccination.

ON STAMPING OUT SMALL-POX.

If every child were properly vaccinated in infancy, and again at puberty, there would be but very little risk of smallpox spreading from imported cases. The law cannot be too compulsory, and should ensure the performance, not only of infantile vaccination, but of re-vaccination also.

PRECAUTIONS TO PREVENT THE SPREAD OF SMALL-POX.

1.—*Every* case of smallpox should be reported to the sanitary authority forthwith.

2.—Whenever a smallpox case cannot be isolated in an airy room, it should be sent to a hospital.

3.—Carpets, curtains, and all needless woollen or other draperies, likely to harbour infection, and unnecessary furniture, should at once be removed from the sick room.

4.—Ample ventilation should be enforced, the windows kept open night and day, so that fresh air may be constantly passing through the sick room and house. A fire in the sick room promotes ventilation.

5 —In the sick room cleanliness is indespensable. Dirty clothes, &c., should be at once put into fresh cold water, and afterwards washed *by themselvs* on the premises.

6.—Nurses and attendants ought to avoid the patient's breath, and the vapour from the discharges; they should never remain long between the patient and the fire; the best position is near the open window; they should wash their hands after each time they touch the patient; and not swallow their spittle, but clean the mouth occasionally with a weak solution of Condy's Fluid. Their dresses should be of cotton, or any smooth or glazed material.

7.—Camphor and vinegar are worse than useless as preventives.

8.—The clothes, bedding, and room occupied by the case should be disinfected.

9.—On recovery, the patient should not be allowed to mix in society until he could produce from his doctor a certificate of freedom of infection.

10.—Every unvaccinated child in the house should be vaccinated without delay, and those inefficiently* vaccinated, or above twelve, should be revaccinated.

11.—Friends or relatives should not visit the infected house and gossip, nor allow their children to go and play with an infected child, however slightly it may be attacked.

12.—Members of infected families should not attend school, places of worship, theatres, courts of justice, workshops, or other places where many people meet together.

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* Efficient vaccination should leave at least three good marks. To perform vaccination *properly* by puncture with a lancet, four or five separate good-sized vesicles should be produced. I vaccinate with Weir's instrument, and produce three or four separate vesicles, each three-eighths to half an inch in diameter.

13.—Schoolmasters should insist on the immediate vaccination of the unvaccinated in attendance.

14.—House-to-house visitation in infected districts, so as to find out the unvaccinated or imperfectly vaccinated, and obtain their protection.

15.—Adults who have not already been successfully revaccinated should be revaccinated forthwith.

16.—The Board of Trade should order the revaccination of sailors.

17.—House drains and sinks, cesspools and middens should be carefully seen to.

18.—Before disturbing heaps of decaying animal and vegetable matter, the filth should be disinfected.

19.—Overcrowding should be prevented.

20.—Infected ships entering the harbour should be placed under quarantine.

21.—Shopkeeper, wash the contents of your till; money may convey smallpox.

22.—Butchers should be compelled to blow up veal by a bellows, and not, as many do, by the mouth.

Process of Disinfection.—I have more confidence in Condy's* Fluids than in any other disinfectants; the manganates and permanganates of potash, of which they are composed are valuable disinfecting and dœodorizing agents on account of their oxidizing powers in the presence of organic matter. By resolving decaying animal and vegetable matters into their ultimate atoms, Condy's Fluid destroys them for ever. It is the most elegant and rapid of disinfectants, and having no offensive smell is unrivalled in the sick room. Chloride of lime is a powerful disinfectant, but it has a villanous odour and corosive action In certain cases sulphurous acid may be used, in others powdered charcoal.

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* Condy's Fluid is a concentrated solution, and for most purposes, therefore, requires to be largely diluted with water, in which state it does not stain. Stains accidentally made on linen, the hands, &c., are easily removed by lemon juice or salt of sorrel. The *weak, or diluted fluid,* for common use, is made by adding one part of Condy's Fluid to two hundred parts of water, or a wine-glassful to a pail, or a teaspoonful to a pint of water. Soap should not be used with Condy's Fluid.

1.—*Everything used by the patient* or in the sick room, such as cups, glasses, plates, &c., should be carefully washed in water containing, per gallon, an ounce of Condy's Red Fluid.

2.—*Linen and washing apparel* should be set to soak in the above disinfecting solution until washed.

3.—*Woollens, bedding, or clothing* should be exposed for a few hours to a temperature of from 210° to 250° Fahr. and the fumes of burning sulphur, in a chamber constructed for that purpose, or exposed in the open air to the sun.

4.—*The infection given off by the skin* may be destroyed by sponging the patient carefully with a warm weak solution of Condy's Red Fluid; at first only the hands and face, and the whole body as soon as the medical attendant thinks it may be safely done.

5.—*The secretions from the mouth, nose, kidneys, and bowels* should be disinfected by being received on their very issue from the body into vessels charged with diluted Condy's Fluid. The patient should not use a pocket handkerchief, but small pieces of rag, which should be burnt directly after use.

6.—*The air of the sick room* should be purified by being impregnated with Condy's Fluid, by means of a glass spray producer, such as ladies use for perfuming rooms, and by cloths wet with Condy's Fluid being suspended in the room.

7.—*The air of the house* may be kept free from infection by stopping, at their exit from the sick room, all germs by a sheet, wet with a weak solution of Condy's Fluid, and suspended so as to cover the whole of the outside of the doorway.

8.—*Immediately after death*, the fireplace and windows of the sick room should be closed, and two or three tablespoonfuls of sulphur placed in a vessel and ignited. The door being closed, the room is to be left until the coffin is ready, when the windows may be opened from the outside.

9.—*The corpse* should, as soon as possible, be placed in a coffin containing powdered charcoal, and interred without delay.

10.—*The sick room no longer occupied* may be disinfected again by the burning of sulphur, the process being allowed to continue several hours. The ceiling should be whitewashed with quicklime, and the walls, floor, and paintwork washed with a solution of Condy's Fluid, an ounce to a gallon.

11.—*The streets should be watered and the drains* flushed with sea water frequently during hot weather. By virtue of the salt in solution the dust would be better kept down and at the same time disinfected. For foul drains it would be necessary to use Condy's Fluid or chloride of lime. It will come within the province of the sanitary inspector to give instructions for the disinfection of ashpits, cesspools, &c.

The preceding directions (excepting those relating to vaccination) for combating the infection and preventing the spread of smallpox are applicable to other "catching" diseases, such as *scarlet fever, measles, typhus, &c.*

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